

People of the Cassini Team

Students use a diverse collection of profiles of people who work on the Cassini–Huygens mission to learn about science as a human endeavor and to reflect on their own career goals and personal impressions of the mission.

PREREQUISITE SKILLS

Reading in the content area of science

Working in small groups

Interpreting narrative information

Taking careful notes

Writing essays

BACKGROUND INFORMATION

Background for Lesson Discussion, page 144

Questions, page 147

Answers in Appendix 1, page 225

56–63: The Cassini–Huygens Mission

77–80: The People of the Cassini Team

EQUIPMENT, MATERIALS, AND TOOLS

For the teacher

Photocopier (for transparencies & copies)

Overhead projector

Chart paper (18" × 22")

Color markers; clear adhesive tape

3-ring binder (notebook)

3-hole punch

For each group of 3 to 4 students

Pencils

Red and blue markers (optional)

Chart paper (optional)

Atlas or world map (optional)



A model of the Cassini–Huygens spacecraft at JPL and a few of the thousands of Cassini team members.

Materials to reproduce

Figures 1–19 are provided at the end of this lesson.

FIGURE	TRANSPARENCY	COPIES
1	1	1 per group
2	1	1 per group
3–18		1 of each (3-hole punched)
19		1 per student (3-hole punched)

Background for Lesson Discussion

In Part II (*Making Connections to Cassini*), Step 6, discussion questions might include:

- *What was missing from the Jobs Chart that was created at the beginning of the lesson compared to the Jobs Chart after hearing the reports on the Cassini Team Member Profiles?*

Here you may expect students to fill in other qualifications besides the easy ones of education, degrees, and technical skills. These might include oral and written communication skills, teamwork skills, creativity, ability to solve problems, openness to new ideas, willingness to persist in the face of adversity, and so on.

- *What do you notice about the work that is required for a space mission?*

It is important to recognize the vast number and diversity of talents, interests, and careers necessary to support and carry out a space mission.

- *What have you learned about the people who are involved in a space mission?*

Not only are the people well-educated and qualified to do their jobs, but they are also basic human beings with families, hobbies, likes, dislikes, and a variety of life experiences that motivated them to choose their career paths.

According to the National Science Education Standards, students should be aware that:

"Women and men of various social and ethnic backgrounds — and with diverse interests, talents, qualities and motivations — engage in activities of science. ...Some scientists work in teams and some work alone, but all communicate extensively with others."

"Science requires different abilities, depending on such factors as the field of study and type of inquiry. Science is very much a human endeavor, and the work of science relies on basic human qualities, such as reasoning, insight, energy, skill, and creativity — as well as on scientific habits of mind, such as intellectual honesty, tolerance of ambiguity, skepticism, and openness to new ideas."

Lesson Plan

Part I: Who Makes a Space Mission Possible?

- 1 Tell the students that they are future candidates for positions at a Space Center. The mission of the Space Center is to design, build, and fly an international robotic spacecraft to explore an outer planet of the Solar System. They are meeting to learn about the different positions available at the Space Center. They will be asked to determine which of the positions is the most appealing to their interests and matches best with their abilities. They will also be asked to select a mentor from among people who are already involved in supporting a spacecraft mission.

- 2 Tape a piece of chart paper on the wall or chalkboard, label it *Jobs Chart*, and divide it into two columns, one marked "Job" and the other marked "Qualifications."

J O B S C H A R T	
Job	Qualifications

- 3 Ask students: What jobs would need to be filled to accomplish the mission? List their responses in the "Job" column.
- 4 Ask students: What qualifications, work habits, skills, and special attributes are necessary for these positions? Record their responses in the right column of the *Jobs Chart*.





Part II: Making Connections to Cassini

- 1 Display a transparency of the *Worldwide Participation Map* (Figure 1). Share with students that Cassini–Huygens is an international robotic spacecraft designed to explore Saturn. Cassini team members are from universities, laboratories, and businesses all over the world. Share with students that Cassini is a similar mission to the one they are planning.

Note: You can extend use of the map into a geography lesson. Put students in groups of 3–4. Give each group some chart paper and blue and red markers. Have student groups identify as many participating states (with red marker) and countries (with blue marker) as they can in 3 minutes. Allow students to use an atlas or world map. After 3 minutes, have students post their charts. Discuss with the students which countries and/or states were not identified.

- 2 Continue by telling students that the Space Center models its selection of team members after the Cassini–Huygens mission to Saturn (which is a collaboration of the National Aeronautics and Space Administration, the European Space Agency, and the Italian Space Agency). In order to learn more about the people and positions available, the candidates for the Space Center mission (that is, the students) will review and share profiles of Cassini team members.

- 3 Arrange students into groups of three. Give each group a copy of the *Profile Summary* (Figure 2) and one of the *Cassini Team Member Profiles* (select from Figures 3 through 18). The groups are to prepare an introduction of this Cassini team member for the whole class by studying the information on the profile and completing the *Profile Summary*. Technical terms used by the featured members of the Cassini team may be found in the *Glossary*.

- 4 After the student groups have had adequate time to read their profiles and to record information about the Cassini team member on their *Profile Summaries*, continue by telling students that you want to help them prepare for their interview at the Space Center by hearing a report about each Cassini team member. Each candidate (student) should listen to the reports for the purpose of identifying a possible mentor for the new mission.

- 5 As student groups share the information on their *Profile Summaries*, the teacher adds relevant information to the *Jobs Chart* using a different color marker. Each group then posts their *Profile Summary* on a bulletin board or on the chalkboard.

- 6 After all groups have presented, and the *Jobs Chart* is complete, ask students to compare the new list of jobs and qualifications to the list created at the beginning of the lesson. Guide students to discover that a broad diversity of people with a wide variety of interests, talents, qualities, and motivations is necessary to design, develop, and fly a mission of scientific exploration like Cassini–Huygens. The goal is to offer a sense of “science as a human endeavor.” (See *Background for Lesson Discussion*.)

Part III: Assessment

- 1 Compile a classroom notebook with all the *Cassini Team Member Profiles* as a reference for students. Ask students to consider which kind of position interests them most, and which Cassini team member they would like to have as a mentor. Allow time for students to review the classroom notebook and the posted *Profile Summaries* prepared by each of the groups, and to ask questions of each other about the different Cassini team members.





- 2 Have each student write an essay that addresses two questions: “Which Cassini team member would you select for a mentor and why?” and “How is the Cassini mission an example of science as a human endeavor?”

Note: If a student’s interests and goals would not lead them to choose a mentor from the Cassini team, then the first question of the essay can be adjusted by asking them to describe an imaginary mentor that would meet their needs.

- 3 Have each student complete a *Student Profile* (Figure 19). Add the *Student Profiles* to the classroom notebook containing the *Cassini Team Profiles*. This becomes a resource that could be shared at parent/teacher conferences, placed in the school library, or displayed at a school open house. Copies of individual student profiles can be placed in student portfolios.

Assessment Criteria

1. *The student selects or describes a mentor in a position that matches his or her interests and goals.*

2. *The student justifies the mentor selection and description from a personal perspective.*

3. *The student uses examples to explain how the Cassini–Huygens mission demonstrates science as a human endeavor.*

4. *The student completes a Student Profile for the Cassini–Huygens mission that includes a personal perspective and possible contributions to a similar space mission.*

Part IV: Questions for Reflection

- What kind of people does it take to support a space mission like Cassini–Huygens? What different kinds of abilities do they need? How many people does it take? What countries are they from?
- What is important to you in choosing a mentor? What is interesting or surprising about the mentor you described in your essay? How is your mentor like or unlike you?



Questions

These questions and their answers can be used to provide background for teachers or to explore prior knowledge and facilitate discussions with students. The answers are found in Appendix 1, starting on page 225.

The Cassini-Huygens Mission

56. Why are we sending a spacecraft and not people to Saturn?
57. What will the Cassini robot do?
58. What spacecraft have been to Saturn? How have we gathered information about Saturn up until now?
59. What will Cassini learn that we do not already know from Voyager and Hubble Space Telescope data?
60. Why care about the Cassini mission?
61. Why is NASA's mission to Saturn called Cassini?
62. How much does the Cassini mission cost? Who pays for it?
63. How long does it take to plan and carry out a mission like Cassini?

The People of the Cassini Team

77. How many people have worked on Cassini?
78. Who manages the Cassini Project?
79. What sorts of people work on a space project like Cassini?
80. How could I prepare for a career involving a space project?





Materials

Figure 1 **Worldwide Participation Map**

Figure 2 **Profile Summary**

Figures 3–18 **Cassini Team Member Profiles**

Figure 19 **Student Profile (2 pages)**





Figure 1

Worldwide Participation Map

Shaded states and countries show participation in the Cassini–Huygens mission.

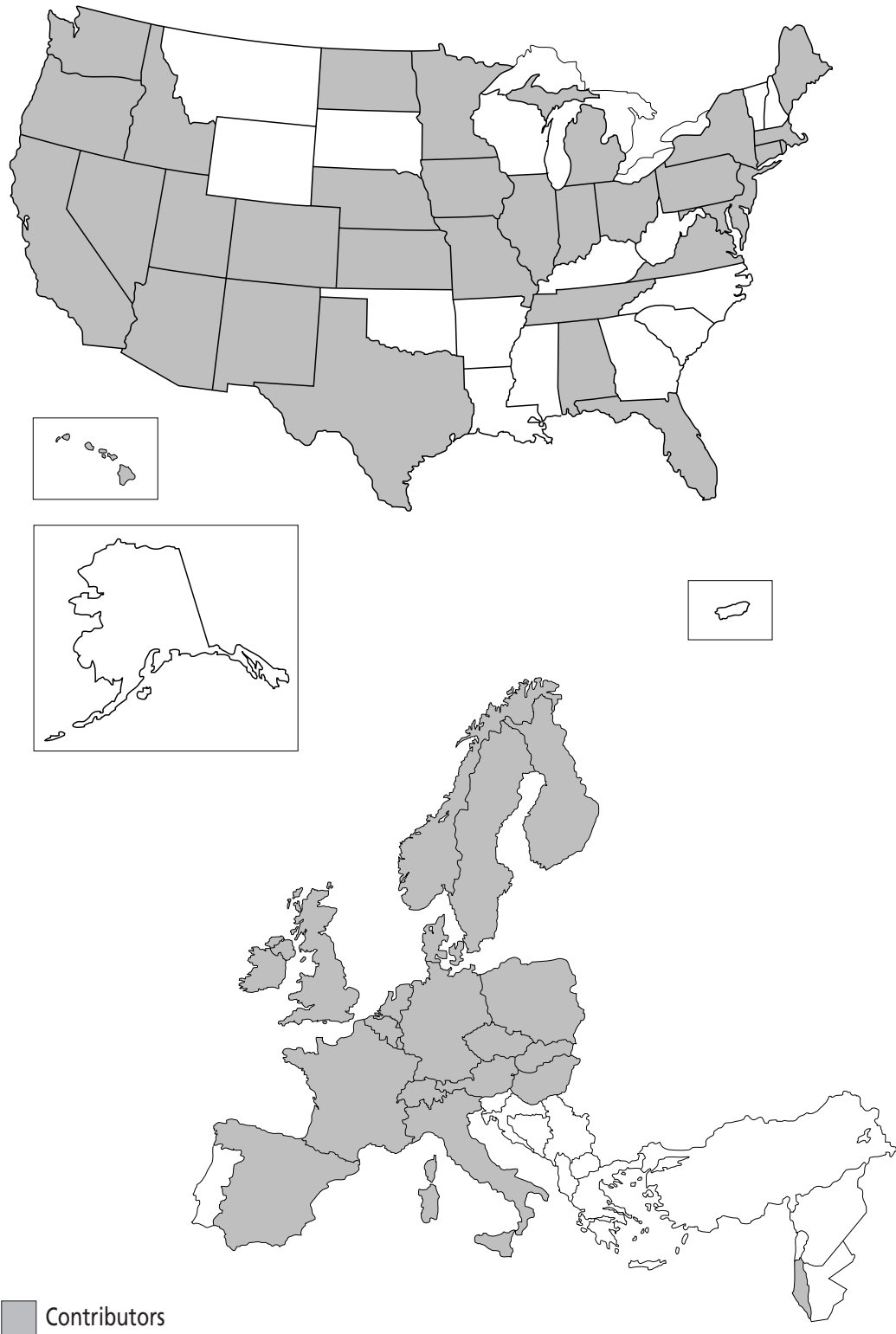






Figure 3

Cassini
Team Member
Profile

Mark Adler *Mission Engineer*

Words of Wisdom

“Find something that you enjoy doing, that has some value to society, and that you have some talent for. Then excel at it — I mean really excel. Pick a path that means something to you, something that touches you, that calls you. If you don’t know what that is, keep looking — it’ll find you.”

Personal

Birth date: 3 April 1959

Home: Pasadena, California

Children: Joshua (b. 1992)

Favorite hobbies:

- Bicycling
- Flying small planes
- Cooking (especially desserts)
- Model rocketry
- Acting and singing in theater

Education

(All in North Miami Beach, Florida)

Elementary: Greynolds Park

Junior high: John F. Kennedy

High school: North Miami Beach

Highest college degree: PhD in Physics, California Institute of Technology

Favorite subject: Mathematics

Least favorite subject: Foreign Language

Subject I wish I had studied more: “Every subject, including more study of foreign languages.”



“Devilishly Handsome, Brilliant, Humble (just kidding), Curious, Quick, Funny”

Professional

What I do for the Cassini mission: I was the Mission Engineer. I had to creatively marry the spacecraft’s limitations and constraints (the robot part) with the ground system’s work force and tool limitations (the people part) in order to best meet the ambitious goals of the scientists (the curiosity part).

In my work, I must know how to:

- Pay attention to important detail
- Find creative solutions to complex problems
- Program a computer to do calculations
- Learn new things quickly
- Find compromises to benefit everyone

The coolest thing about my work is: Learning about lots of other people’s jobs, and their part of the mission. Getting a very wide, and in places, deep understanding of the entire mission.



Mark Adler, continued

How I describe Saturn: Big, Cold, Beautiful

How I describe Cassini: Magnificent, Audacious, Expensive

Why care about Cassini? If Cassini does half the things we planned for it to do, it will be one of the great explorers of all time. Cassini is an extension of yourself reaching out to touch another world. You don't want to sleep through that! Here is my favorite quote about exploration, from T.S. Eliot:

*We shall not cease from exploration,
And the end of all our exploring
Will be to arrive where we started
And know the place for the first time.*

Human Interest**My First Looks at the Sky**

I noticed the moon and stars right from the start. I guessed that the stars were suns, but I thought that the moon was an impaired reflection of the Earth. Planets I had to read about before I noticed that some of the stars wandered. That was in about the third grade — it was then that I started doing a lot of science reading.

How I Came to Cassini

I've pretty much always wanted to be involved in the exploration of space, since watching the Apollo missions when I was a kid. Exactly how

I would be involved wasn't clear. In fact it probably still isn't, but I'm happy—I'm making significant contributions to a great adventure.

My parents had little money for my education, so I did computer consulting on the side to pay for my bachelor's and master's degrees. I got a fellowship from an aerospace company that paid for my PhD. Typically a PhD degree is in the same subject as the master's and bachelor's, but all of mine were different. In addition to my PhD in Physics from Caltech, I earned an MS in Electrical Engineering and BA in Mathematics, both from the University of Florida. This diversity turns out to be a strength for my work and lets me do jobs in which I have to understand a wide range of subjects.

My Work Environment

I work in a "cubicle," kind of like a bathroom stall, but a little bigger and without the door. I've worked with probably a sixth of the people on the Cassini project at one point or another, which is a lot. This was because my job involved understanding nitty gritty details of many aspects of the spacecraft hardware, the operations of the spacecraft, the path the spacecraft will follow on the way to Saturn, and the science observations to be done.

Ten Years from Now?

I'd like to be preparing a human mission to Mars.



Figure 4

Cassini
Team Member
Profile

Rozita Belenky *Flight Systems Engineer*

Words of Wisdom

"I think the most important aspect of human life, regardless of age, is continual learning. Missions such as Cassini allow for learning of the new, but most importantly, they inspire new minds to reach farther than before, allowing for even more learning. Regardless of what the budget situation looks like on Earth, money should be made available to further our knowledge and the exploration of the unknown."

Personal

Birth date: 20 January 1970

Home: North Hollywood, California

Children: not yet

Favorite Hobbies:

- Theater
- Opera

Education

I started my schooling in the former Soviet Union, but I went to junior and senior high schools in Los Angeles, California.

Highest degree: MS in Aerospace Engineering, University of Southern California

Favorite subject in school: Math

Least favorite subject in school: I can't think of one.

Subject I wish I had studied more: Non-engineering classes; to learn more diverse subjects.



"Dedicated, Resourceful, I laugh a lot"

Professional

What I do for the Cassini mission: I work in flight systems operations. In particular, I am involved in writing and testing computer procedures that control the attitude and orientation of the Cassini spacecraft. I develop sequences that will be sent to the spacecraft, and I analyze data Cassini sends back to Earth. My immediate team is 9 members strong, but I have to interface with many people from different areas on a daily basis.

In my work, I must know how to:

- Apply basic math skills
- Analyze data
- Use and program a computer
- Manage my time efficiently
- Work well with others
- Laugh a lot

Rozita Belenky, continued

The coolest thing about my work is: Being a part of the Cassini team. It's still unbelievable to me that this spacecraft will travel so far away from "home" and let us in on some secrets of the Universe.

How I describe Saturn: Mysterious, Complicated, Fascinating

How I describe Cassini: Exciting, International, Understaffed

Why care about Cassini? Everyone should care about such important projects. The desire to learn and better oneself is a human characteristic that can flourish only when there is something worthy, exciting, and intellectually stimulating to discover. Discovery arouses curiosity, and the more we learn, the more we realize there is still more to be learned. Space exploration (such as the Cassini mission) is key to intelligent human life forms of the future.

Human Interest**Friends and Relatives in the Soviet Union**

My family and I immigrated to the United States from the Soviet Union when I was 10 years old. At that time, no one would imagine that I would end up where I am now. Some of them still can't imagine it! "Space" was something that most people just read about or watched on TV specials. To them, it seemed like an unrealistic goal to work on a "space" project. Of course, my family was incredibly supportive of my goals and very proud of my accomplishments. I first became interested in engineering when I entered junior high, and now here I am! Whenever a spacecraft story makes the news, I get many phone calls and questions from my friends and family members. I think that knowing someone like me who works at the Jet Propulsion Laboratory (JPL) makes people more aware of the space program and makes them pay a little more attention to the news.

Ten Years from Now?

I will hopefully still be involved with flight projects at JPL (that's most exciting to me).



Figure 5

Cassini
Team Member
Profile

Right: Bonnie
(in dark glasses)
with her
three sons
and mother on a
sailboat in
Pennsylvania.

Bonnie J. Buratti *Investigation Scientist*

Words of Wisdom

“Whatever you do in life depends on your own efforts. Trust yourself and be yourself. Strive to achieve all you can, but remember that what kind of a person you are is what ultimately counts. Say little and do much, and learn from all men and women.”

Personal

Birth date: 24 March 1953

Home: Altadena, California

Children: Nathan (b. 1983), Reuben (b. 1986), and Aaron (b. 1988)

Favorite hobbies:

- Skiing and ice skating
- Hiking with family
- Growing organic foods
- Reading and studying languages
- Cooking, sewing, decorating

Education

Elementary: Coopersburg Elementary School, Pennsylvania

Junior high: Southern Lehigh Jr. High

High school: Southern Lehigh High School, Pennsylvania

Highest college degree: PhD in Astronomy and Space Sciences, Cornell University (Ithaca, NY)

Favorite subject: Science

Least favorite subject: Driver's Education

Subjects I wish I had studied more: More foreign languages like French and German.



“Inquisitive, Energetic, Interested in everything”

Professional

What I do for the Cassini mission: I am the Investigation Scientist for one of the 12 instruments on Cassini — the Visible and Infrared Mapping Spectrometer. It will tell us more about what Saturn and its rings are made of.

In my work, I must know how to:

- Observe with large telescopes
- Apply mathematics and physical science
- Use computers and the Internet
- Write papers and proposals
- Work with teams of 3 to 20 people

The coolest thing about my work is: There is nothing routine about it. It involves the joy and wonder of discovery.



Bonnie J. Buratti, continued

How I describe Saturn: Mysterious, Beautiful, Big

How I describe Cassini: Exciting, Worthwhile, Challenging

Why care about Cassini? The Cassini mission represents the tradition of discovery that has made the human species great. It will answer questions about the origin of the Solar System and life on Earth (Titan, a satellite that will be closely studied by Cassini, is sort of an “Earth in deep freeze”). We hope the success of Cassini will inspire students to excel in their own studies so they can perform even greater feats. Finally, discoveries from the Cassini mission and other NASA missions have been useful right here on Earth — in medicine, computers, robotics, and materials.

Human Interest**How I Became Interested in Space**

I was hooked in third grade when I read a book called *A Child's Book of the Stars*. I was home sick that day. I was particularly fascinated by a picture that showed a steaming rain forest on Venus. (Now we know that's wrong; Venus is way too hot for life to exist there!)

What My Work Environment Is Like

I'm usually in my office, hooked into my computer. I use it to do calculations, run models,

and analyze data from telescopes and previous space missions (especially Voyager). I communicate with other scientists by e-mail, and I do a great deal of writing, mainly papers and proposals. For my work on Cassini, I often work with teams of people, usually 3 to 20 other scientists and engineers. We have meetings or work in laboratories where the instrument is in an environment similar to that in space. I sometimes take data at telescopes on mountain tops, such as the large one on Palomar Mountain. My job involves a lot of travel, often to Europe where I meet with our Cassini European colleagues. I attend scientific conferences all over the world.

Can a Scientist Raise a Family?

I am very proud of the fact that I have raised a family while continuing in a successful career as a scientist. In 1983, I was the first graduate student in the Astronomy Department at Cornell to have a baby, and many faculty members found it hard to accept that I was the same scientist after the birth. I defended my PhD thesis when my first son was only 4 months old. In 1985, I think I was the first pregnant astronomer to observe at Palomar Mountain.

Ten Years from Now?

I will be analyzing data from Cassini!



Figure 6

Cassini
Team Member
Profile

Karen M. Chan (Karenator) *Secretary*

Words of Wisdom

“Go to school, study hard, extend yourself beyond what’s easy for you. Don’t be afraid to fail; make yourself try again. Listen to your parents. Love and spend time with your family; they will be the biggest supporters in your life. Take time to play and make friends because friends will add to the adult you become. Learn the difference between right and wrong, and always do right.”

Personal

Birth date: 27 April 1963

Home: Monrovia, California

Nephews: Christopher (b.1990) and Andrew (b. 1994)

Favorite hobbies:

- Dodgers baseball
- Softball
- Jazzercise
- Crafts
- Reading

Education

(All in Los Angeles, California)

Elementary: Arlington Heights

Junior high: Louis Pasteur

High school: Los Angeles

Highest college degree: BA in English from California State University Northridge (1984), emphasis in poetry

Favorite subject: Art, acting, and creative writing

Least favorite subject: Math

Subject I wish I had studied more: More physical sciences and geosciences that would help me understand more about planetary exploration.



“Flirty, Cute-but-Intelligent, Bossy”

Professional

What I do for the Cassini mission: I am a secretary in the Cassini Program Office at the Jet Propulsion Laboratory (JPL). I support some of the senior engineering managers who run the program. I handle a lot of the day-to-day operations like scheduling, ordering supplies, and fixing jammed copiers and printers. I also spend time training others how to use different types of computer software or how to handle the “red tape” of complex administrative procedures. Having majored in English, I can make sure other people understand better what my managers (engineers) are trying to say! Sometimes when people ask me what I do in my job, I tell them “Waitress, maid, and mother” because often that’s what it feels like.

In my work, I must know how to:

- Use computers and office-related software
- Use electronic mail, fax, and phone systems
- Diagnose and correct computer problems
- Smile, even when things are rough
- Communicate with a diversity of people
- Learn new things all the time
- Think ahead and anticipate people’s needs



Karen M. Chan, continued

The coolest thing about my work is: Working directly in the Cassini Program Office, I get to be where all the action is, and that's very exciting. I've actually learned quite a bit about Saturn and Cassini.

How I describe Saturn: Big, Beautiful, Wondrous

How I describe Cassini: Amazing, Beautiful, Expensive

Why care about Cassini? Every endeavor which is begun today will affect how you may be able to live your life in the future. How can we know if humans can live in space if we don't know what's out there? Space exploration is important for learning how planets developed and what might be done to extend life into the Solar System. Cassini will return lots of great data and beautiful pictures, and we'll learn so much more about the Saturn system and Titan.

Human Interest**My First Looks at the Sky**

I first learned about stars and planets in school, but didn't really pay that much attention until a botany class camping trip. My science teacher got us kids together and pointed out a bunch of planets and constellations and told us some stories about what we were seeing. After that, it was "Wow...stars!"

My Work Environment

I work in the Cassini Program Office alongside several other secretaries. My "office" is an open-landscaped cubicle which I share with another secretary and a student-intern. There's no way

to hide in here! At my desk I have both a Macintosh and PC computer, and I do use both of them at the same time. I have a motto: "Whatever Happens, Smile." I use this a lot whenever I'm dealing with people who are more difficult to deal with. In my job I also get to meet and deal with a lot of people from many areas of life, and I really enjoy that a lot. Sometimes you get me talking with folks and I can't stop!

How I Came to Work on Cassini

When I was little, I remember wanting to be a ballerina, nurse, fireman, or race car driver. When I got older, I added the possibilities of becoming President of the United States, an actress, or a newspaper reporter. When I graduated from college, I wanted to write children's books.

My first job was in a student work-study program at Cal State Northridge. I worked in the Geology department office, and this was my first taste working with computers and office organization. After graduating, I worked for an insurance company for a while. I left that job to spend a summer in Taiwan, and upon returning a friend suggested that I check into JPL because her father worked there (and, she said "there are tons of cute guys!"). As it turned out, her father hired me because his secretary quit unexpectedly, and I've been working for him ever since.

Ten Years from Now?

I'd like to move to higher levels of work in administration and office management. I've also thought about training to be a computer consultant and maybe starting my own business. Maybe somehow I'll still be helping Cassini scientists do their work.



Figure 7

Cassini
Team Member
Profile

Right: Carrie
is the "Mom"
in the middle.

Carrie P. Duitz *Teacher and Education Specialist*

Words of Wisdom

"We should strive to be responsible citizens, caring for others, offering a helping hand, and sharing our talents. When we give gifts of kindness and friendly smiles to others, they are encouraged to do the same. The greatest gift we can give ourselves is to learn. There is no end to what we can learn, and learning is the path that leads to our dreams."

Personal

Birth date: 21 April 1957

Home: Thornton, Colorado

Children: Jake (b. 1982), Nicole (b. 1983), Zach (b. 1987), and Barb (b. 1988)

Favorite hobbies:

- Camping and boating
- Watching my kids play soccer
- Writing and learning

Education

Elementary: Northeastern Elementary

Junior high: Hastings Jr. High

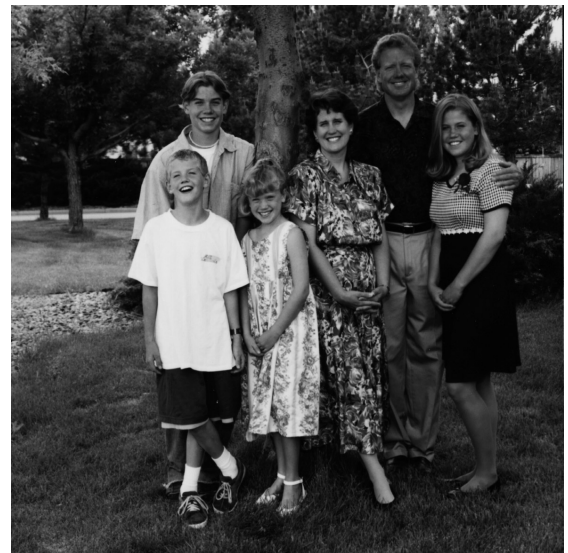
High school: Hastings High

Highest college degree: Masters of Education Instruction, Colorado State University
PhD in progress, University of Denver

Favorite subject: Chemistry

Least favorite subject: Physical Education
(However, my husband Tom is a P.E. teacher, so I make an enthusiastic fan!)

Subject I wish I had studied more: Math



"Caring, Creative, Organized"

Professional

What I do for the Cassini mission: I work with a scientist at the Space Science Institute in Boulder, Colorado, and a team of teachers to write lesson plans that will help students learn about Saturn and the Cassini mission. The scientist I work with communicates with many scientists and engineers at JPL where Cassini was assembled. I also teach teachers about Saturn and the Cassini mission so they are inspired to teach their students about the mission and associated science concepts.

In my work, I must know how to:

- Connect Cassini to students' needs in science
- Write effective lesson plans
- Make learning focused, challenging, and fun
- Work with teachers and scientists
- Clearly explain my ideas and listen carefully to other people's ideas

The coolest thing about my work is: Watching students question, explore, and test their ideas. I can always tell when they finally understand something they have worked hard to learn.



Carrie P. Duits, continued

How I describe Saturn: Huge, Magnificent, Alluring

How I describe Cassini: Fast, International, Remarkable

Why care about Cassini? Cassini is proof of the incredible learning that takes place in schools all over the world. The people who have made Cassini possible have valued their education. Their work inspires others to reach for the stars. As an international effort, Cassini is a robot that brings many people together. Cassini will help us discover what we want to learn next!

Human Interest**How I First Became Interested in Space**

Every year of my life, my family and I have spent our summers at a cottage in northern Michigan. When I was a little girl, I always thought we were at the top of the world. The stars seemed to multiply in the clear, dark night sky. The full Moon stretched a ribbon of moving light across the lake. The wonders of the aurora borealis sparked my summertime thoughts. Because of these childhood memories, I used to think about space as a way to teach poetry and story telling. But when I attended a workshop for teachers called Marsville, I discovered a new way to teach about space. Marsville's ideas for teaching the science of Mars were creative, exciting, and fun. My students were challenged to think creatively and critically as they designed systems for human survival on Mars. I grew to love the planet and the enthusiasm that it sparked within my students. As a result, ideas for teaching about space started to snowball in

my mind. I've been hooked on space ever since. Its my mission to inspire other teachers to teach space education.

How I Came to Cassini

I serve on a committee in Colorado whose goal is to find ways that will encourage teachers to teach space education to all students in the state of Colorado. Randy Sachter is a teacher at Nederland Elementary School who serves on the state committee with me. She gave my name to Dr. Cheri Morrow, a scientist at the Space Science Institute in Boulder, Colorado. The Jet Propulsion Laboratory (JPL) had granted Cheri the opportunity to work with educators and JPL scientists to develop materials for teachers that would help students all across the United States learn about the exciting Cassini mission. Since I love inspiring teachers to teach about space I jumped at the chance to work with a dynamite team (including Cheri, Randy, Melody Randall, and others).

My Work Environment

When we discuss Cassini lesson plans, I work with teachers, a scientist, and a graphic artist (Steve Mercer) at the Space Science Institute in Boulder, Colorado. We work in a conference room that has walls of glass. We are inspired when we look at the mountains to the west, the vast sky to the south, and the rocket that hangs from the ceiling in the lobby. When I draft Cassini lesson plans, I work very late at night when my kids are all in bed and the house is quiet! My dog, Buddy, sits by my green rocking chair watching me work on my laptop computer and waiting for me to turn off the lights.



Figure 8

Cassini
Team Member
Profile

Sharon Elaine Grant *Mission Planner*

Words of Wisdom

"In my opinion, the most important thing to remember is to be happy with yourself. I try to accomplish this by following these simple guidelines: Enjoy what you do, be observant, never stop learning, don't waste time, maintain a positive attitude, and give of yourself in any way you can without expecting anything more in return than the warm satisfaction of knowing you've made someone's day a little brighter."

Personal

Birth date: 6 July 1973

Home: Tujunga, California

Children: None (a dog: Wolfgang)

Favorite hobbies:

- Singing and playing the guitar
- Theater
- Swimming and scuba diving
- Camping and skiing
- Reading
- Playing with my dog
- Skydiving

Education

(all in San Antonio, Texas)

Elementary: Coker, Thousand Oaks, and Harmony Hills

Junior high: Eisenhower Middle

High school: Churchill High

Highest college degree: BS in Aerospace Engineering, University of Texas at Austin

Favorite subjects: Math, English

Least favorite subject: History

Subject I wish I had studied more: Spanish



"Outspoken, Enthusiastic, Persevering"

Professional

What I do for the Cassini mission: As a Mission Planner, I assist in coordinating various spacecraft activities. There are many things to keep track of on the spacecraft. Is there enough power? Is there space on the recorder to store the information? Is there time to send the information back to Earth? If an activity takes propellant, is there enough to spare? Will the spacecraft be pointed in the right direction? Are any rules of the mission being violated? I ask all of these questions and many more, in order to help schedule mission activities.

In my work, I must know how to:

- Apply math and science principles
- Handle the unexpected
- Program a computer
- Be eager to know and learn
- Communicate effectively
- Be responsible for deadlines
- Keep a positive attitude

The coolest thing about my work is: Knowing that I am an integral part in such an important, ground-breaking task.



Sharon Elaine Grant, continued

How I describe Saturn: Intriguing, Beautiful, Enigmatic

How I describe Cassini: Resourceful, Intricate, Powerful

Why care about Cassini? I believe the Cassini mission will be a positive influence on humanity through all of the knowledge gained and because it will spark desire for knowledge and accomplishment in many potential leaders of tomorrow. Space missions, Cassini especially, serve as excellent means for international cooperation.

Human Interest**My First Look at the Stars**

As a kid, I went to a summer camp in the Texas hill country. It was so clear, and there were no lights for miles, so I could see more stars with my naked eye than I've ever been able to see anywhere else.

How I Came to Cassini

My career preference was not always in the spaceflight industry. I wanted to sing, and I wanted to teach others to sing. At one point I also wanted to be a social worker. Finally, I chose to be an aerospace engineer. Before working at the Jet Propulsion Laboratory, I had many different types of jobs. I've been a camp counselor, a teaching assistant, a waitress, and I've worked in an experimental lab to test sonar signals. Each of these jobs has taught me skills that I still use in work and in life today. I really

love my job at JPL as a Mission Planner. Sure, everything doesn't always happen exactly the way I plan, and sometimes work can become demanding, but as long as I keep a good attitude about my job, I have fun and I look forward to accomplishing more every day.

My Work Environment

I work in an office. My shelves are filled with references including college textbooks, technical magazines, computer manuals, Cassini project documents, etc. I must wear a badge with my picture on it (ick!) around my neck at all times. I work with many different people every day. Most work at JPL, but some work at other locations around the country and even around the world.

My Most Challenging Experience at Work

In my second year at the University of Texas (at age 19), I started working at JPL as a "Cooperative Engineering Education" employee. I was using physics principles from college to analyze the Cassini spacecraft's ability to keep from tumbling when it flies by Titan, Saturn's largest moon. I sometimes wondered how I was given the opportunity to work on such a task with the education I had. This experience gave me more confidence in my abilities as a student and as a professional engineer.

Ten Years from Now?

I hope to have earned a Master's Degree, and I hope to be working on innovative space mission ideas and technologies.



Figure 9

Cassini
Team Member
Profile

Michael Quinley Hooks (Mike) *Archivist and Historian*

Words of Wisdom

"I would like to think that I have succeeded in my life because I care about others and they care about me. I believe that it is important to treat people, regardless of age or cultural differences, with respect, honor, and caring. If you do this, they will treat you in the same way. Work hard, dream your dreams, and make them happen. Set goals and achieve them, never give up, and never say die. And, do not blame others all the time for the problems facing all of us. Strive to make the world a better place for everyone."

Personal

Birth date: 2 October 1947
Home: Los Angeles, California
Children: None (a dog: B.J.)

Favorite hobbies:

- Traveling
- Collecting baseball cards
- Collecting model cars
- Swimming in my own pool
- Visiting the beach or mountains

Education

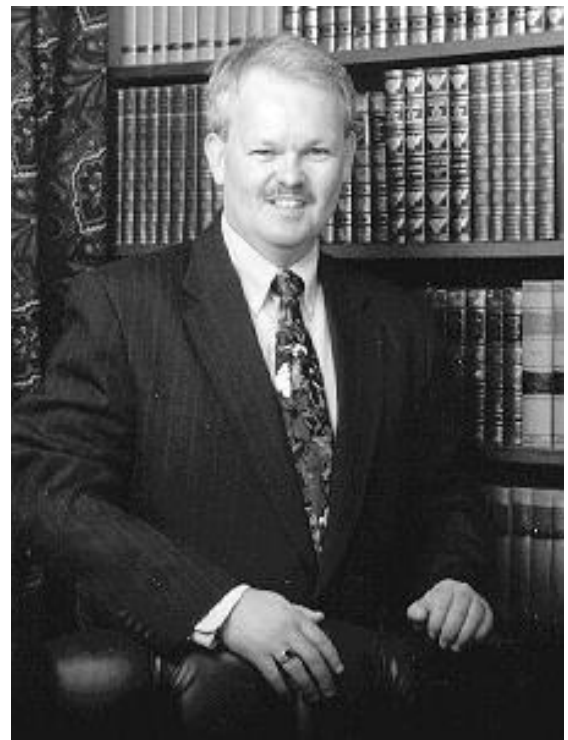
(All in Henderson, Texas)
Elementary: Central Elementary School
Junior high: Henderson Jr. High
High school: Henderson High

Highest college degree: PhD in History, with a minor in Urban Geography, Texas Tech University

Favorite subjects: History, Government/Civics

Least favorite subject: Geometry; I just could not get it.

Subjects I wish I had studied more: Geology and Geography



"Optimistic, Organized, Hardworking"

Professional

What I do for the Cassini mission: I am the Chief Archivist for the Jet Propulsion Laboratory. This means that I am responsible for identifying, collecting, preserving, and making available the historical records pertaining to the Laboratory and its various projects, tasks, and activities. This includes the historical records of the Cassini mission. The records can come in various forms, such as paper, photographs, compact disks, tapes, videos, and oral history interviews with people involved in the mission.

In my work, I must know how to:

- Be familiar with the history of JPL
- Work with people
- Use a computer
- Research and discuss historical records
- Persevere when it seems overwhelming



Michael Quinley Hooks, continued

The coolest thing about my work is: Being at JPL itself. Working with interesting people. Knowing that I am preserving information about space missions that will be of value to researchers in the future who wish to know more about the “whys” and “hows” of things at the Laboratory.

How I describe Saturn: Beautiful, Fascinating, Mysterious

How I describe Cassini: Ambitious, Well-planned, Beneficial to the American people

Why care about Cassini? We should care about the Cassini mission because it represents that continuing need of the American people to explore, to expand their interests, and to learn more about the unknown. We should care about the mission because it represents the end of an era of great missions, an era of much success in expanding our knowledge of the Universe and beyond. So many people have put so much time and energy into the mission, and will continue to do so after Cassini is launched, so I want to see it succeed. I also want Cassini to succeed for the benefit of the American people, who continue to support the space program and understand its value to the nation and the world.

Human Interest**How I First Became Interested in Space**

I am not sure when I first noticed the sky, but I remember helping my older brother and his friends launch small rockets in the field near our house, and wondering what it would be like to be launched into space. This was in the late 1950s and early 1960s, at the time NASA was formed and working on the Apollo program to

send astronauts to the Moon. Later, when I moved to West Texas, where the land is flat and the sky is so clear at night, I would look at the stars and wonder what it would be like to actually see them up close.

How I Came to Cassini

When I was younger, I guess I really wanted to be a baseball player when I grew up. Baseball was so much more popular when I was a kid than was football or basketball. Unfortunately, I was not a good athlete, so I had to channel my baseball interest into collecting baseball cards. As I grew older, I became very much interested in history and decided that I wanted to teach history at the college level and to write books on historical events and people. This interest in history then turned toward collecting the historical information that others would use to write their books and teach their classes. Before coming to JPL, I was the Archivist for the Texas General Land Office in Austin, Texas, for 5 years. Before that I was the Associate Archivist at Texas Tech University for a little over 7 years.

Overcoming Adversity in My Career

I owe much of my success to my parents and to my mentors. Although neither my father nor my mother has a college degree, they instilled in my brother and I the value of education, hard work, and commitment. My brother also has his PhD (in Economics), and he teaches at the University of Alabama. So, the influence of my parents is a large part of my professional success. In addition to my parents, the influence of people whom I see as mentors in my profession has been important. They have helped me in achieving success with their training, guidance, knowledge, and support.



Figure 10

Cassini

Team Member

Profile

Christopher A. Kelly (Banish) *Security and Fire Dispatcher*

Words of Wisdom

“Never quit wondering, and never, ever quit asking. Ask until you get an answer.”

Personal

Birth date: 24 September 1963

Home: Fontana, California

Children: Michael (b. 1989)

Favorite hobbies:

- Computer games
- Surfing the Internet
- Jogging
- Racquetball
- Weightlifting

Education

Elementary and junior high: (Grades 1–8):
St. Rita’s Catholic School, Sierra Madre,
California

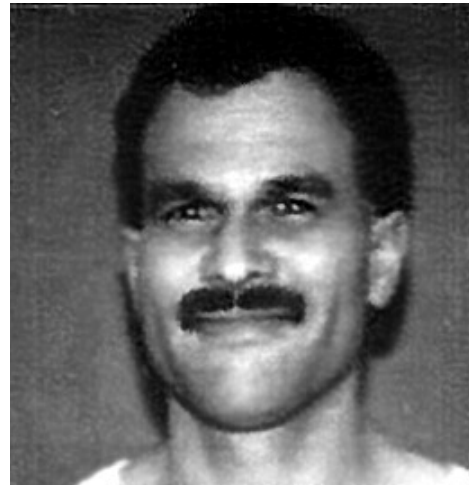
High school: St. Vincent’s Seminary,
Montebello, California

Highest college degree: Associate of Arts degree
at Pasadena City College (pending)

Favorite subject: History. I find it fascinating to study the events and people that have affected and continue to affect our everyday lives; everyone from world leaders to the people who carry out their decisions.

Least favorite subject: Speech. I don’t like speaking in front of crowds.

Subject I wish I had studied more: Speech. I think more of this class might have helped me overcome my dislike of speaking in front of crowds.



“Curious, Understanding, Sensitive”

Professional

What I do for the Cassini mission: I work in the Emergency Operations Center dispatch. I maintain a secure environment/work area for the people who work on the Cassini spacecraft. From the dispatch center, we can view and monitor many of the areas of the Jet Propulsion Laboratory using closed-circuit TV. In addition, we have an alarm computer, which gives us reports from different areas of the Lab. If someone were to enter the Cassini area without proper authorization, I would receive an alarm, and dispatch or send officers to that area.

In my work, I must know how to:

- Use many types of computers
- Communicate effectively with others
- Be resourceful
- Pay close attention

The coolest thing about my work is: Seeing some of the things that have been and continue to be built here at JPL. The Galileo spacecraft is a good example. I’ve seen it, and I’ve talked with



Christopher A. Kelly, continued

the people who designed and built it. Now I read about it in the newspapers and see it on TV. The Cassini mission will be the same way. This is history, and I have a front-row seat!

How I describe Saturn: Wondrous, Breathtaking, Inspiring

How I describe Cassini: Capable, Ambitious, Noble

Why care about Cassini? This spacecraft is far and away one of the most well-designed ever assembled. It has been designed and built by some of the finest minds and people in the world. Thousands of people have spent years creating it. This spacecraft will answer questions people have had about Saturn for a long time. This is a noble venture! I think lots of things we know about we tend to take for granted, such as the Moon. What we know about the Moon today was the result of thousands of people, and 20 years worth of work. And there are still questions that need to be answered. People should never quit wondering and asking.

Human Interest**How I First Noticed the Stars**

Funny story here. I come from a large family, and my mom would occasionally sit outside on the porch and just look at the stars. This was her quiet time. So, I'd sit out there with her, and look. I asked her what they were, and she

told me that they were "angels washing dishes." Never forget that one! Well, I learned later that she was not totally truthful with me, but I'd still sit out there with her. She would show me the different constellations — the Big Dipper and so on.

How I Came to Work at JPL

I started out wanting to be a priest. I attended the major Seminary in Perryville, Missouri, and discovered there that it was not meant to be. I returned to the Southern California area to attend school, and obtained part-time work with JPL. I applied for a full-time position and was accepted. The Lab is a great place to work. It is quite satisfying to see some of my own ideas regarding my job taken and made part of the job. The best "perk" that comes with my job is the "front-row seat" I have in watching the history-making events of deep space exploration.

My Most Challenging Experience at Work

Without a doubt, one of the most trying times during my employment with JPL was the day of the Northridge earthquake. It happened at about 4:30 in the morning, which is my regular work shift. It went from a quiet shift to total chaos. I must have answered about 1,000 phone calls, dispatched people to countless areas requiring a check, contacted many of the people responsible for the Laboratory, reporting to them the condition of the Lab. It was a very difficult time, and I believe I handled it well.



Figure 11

Cassini
Team Member
Profile

Charles E. Kohlhasse (Charley) *Science and Mission Design Manager*

Words of Wisdom

“Rise early and seize each day, learn much and use this knowledge well, spend time with those you love, never abuse your pets, use logic to fight the irrational (for it is everywhere), defend the environment and its wildlife as a knight would protect King Arthur, meld mind and heart for greatest creativity, follow your dreams, and become all that you can be.”

Personal

Birth date: 15 August 1935

Home: Pasadena, California

Children: Wendy (b. 1961), Alison (b. 1960)

Favorite hobbies:

- Taking photographs
- Hiking and exploring the wilderness
- Playing golf
- Reading
- Developing computer adventure games
- Creating images using Photoshop and 3-D modeling programs

Education

(Both in Chattanooga, Tennessee)

Elementary and junior high:

Missionary Ridge

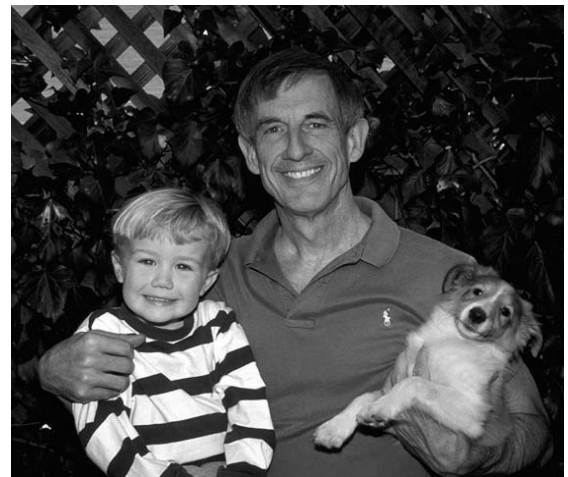
High school: The McCallie School

Highest college degree: Master of Engineering, UCLA

Favorite subject: Calculus

Least favorite subject: History

Subjects I wish I had studied more: Computer Graphics, Multimedia, Art, and Architecture.



“Alive, Honest, Bright, Multidimensional”

Professional

What I do for the Cassini mission: Rather than being an architect who builds a large house, I am like an architect who designs a complex mission to another world. I have half a dozen talented people leading the work in different areas, and each of them has many engineers and scientists helping them. It is our job to decide how to go from Earth to Saturn, what demands to place on the robotic spacecraft to accomplish the scientific mission, and how to best orchestrate the total adventure.

In my work, I must know how to:

- Manage people
- Anticipate problems
- Apply math, physics, and astronomy
- Simplify a complex problem without overlooking anything important
- Have self-confidence
- Have strong intuition and a sense of humor

The coolest thing about my work is: Pulling the mission together like a large jigsaw puzzle, and not having a single piece out of place.



Charley Kohlhasse, continued

How I describe Saturn: Vast, Beautiful, Remote

How I describe Cassini: Complex, International, Exciting

Why care about Cassini? I care about Cassini because it shows that there are ways to accomplish any task, no matter how difficult it might seem. It proves that nothing is beyond a person or a team of people who have the knowledge and the imagination. It shows that education counts for a lot. Time invested in exploring and learning is always returned many times over as life passes.

Human Interest**How I First Became Interested in Space**

I first turned on to space (age 10–12) in reading stories by Isaac Asimov and other science-fiction writers. Amazingly, at a 40th high school reunion, an old friend said he used to remember me (when I was 12 or 13) lying in the grass at night looking up at the stars. He was not surprised to learn of my space career.

How I Came to Cassini

When I was 12, I wanted to be either a jet fighter pilot, a matador, or an architect. I would have chosen architecture, but my father could not afford to send me to the 5-year program, so I went for a 4-year physics degree, as it was the only area in which my father could not intimidate me. He said that it was the greatest mistake of my life, but I did it anyway. I do not know how I resisted his will. He even stopped paying

my tuition and board, so I got a student-teaching job, as well as running a large dormitory, to make ends meet. Before starting work at JPL, I had done such jobs as working in a large candy company, “goosing” golf greens to remove the crabgrass, and even serving as the electrical officer of a nuclear weapons team aboard an aircraft carrier (not because I like nuclear weapons, but because I wanted an assignment related to physics on a ship large enough that I would not get seasick very much).

My Work Environment

I work at the Jet Propulsion Laboratory in an office with a nice view of the mountains and some nearby trees. Once, many years ago, I saw seven California condors circling overhead.

My Most Challenging Experience at Work

I had been at JPL for 10 years when I had to okay the science platform pointing angles for a brief flyby of Mars. The values output by the computer did not seem quite right, and I adjusted them by a mental calculation. The hour that followed was the longest in my life, waiting to see whether we had pictures of the Martian surface . . . or of deep space!

Ten Years from Now?

I expect to be working to save our natural environment, hiking to the last of the beautiful regions on Earth, writing a fictional adventure novel set around the turn of the next century, and trying to create some really first-class digital fine art.



Figure 12

Cassini
Team Member
Profile

William S. Kurth (Bill) *Scientist and Principal Investigator*

Words of Wisdom

“Plan to do what you *like* to do with your life. While choosing a career based on how much money you can make sounds important, all that money is of little value if you aren’t enjoying what you have to do to earn it. Prepare yourself for any career by staying in school as long as you can and by taking all of your classes seriously. It is less important *what* you major in in college than that you actually complete a course of study and learn to learn. Use part-time jobs on campus to explore different areas you might be interested in; these will give you an insight into what that type of work is *really* like.”

Personal

Birth date: 7 February 1951

Home: Coralville, Iowa

Children: Steven (b. 1975), Brandi (b. 1978), Marisa (b.1981), Jeremy (b. 1993)

Favorite hobbies:

- Photography
- Astronomy
- Radio-controlled airplanes

Education

Elementary: Oakwood Elementary, Charleston, West Virginia

Junior high: Taft Jr. High School*

High school: Jefferson High School*

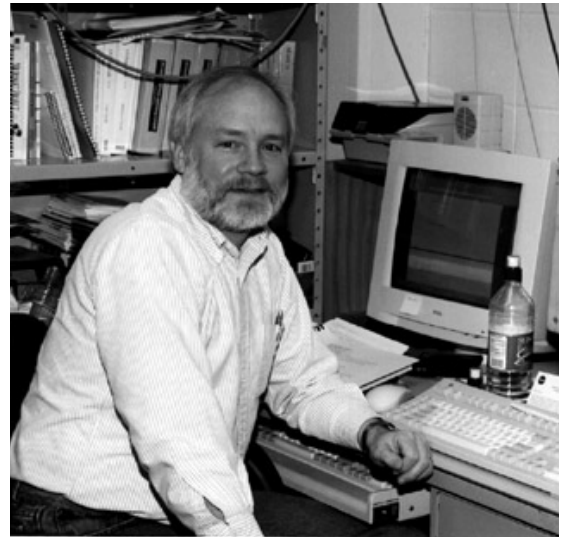
*Both in Cedar Rapids, Iowa

Highest college degree: PhD in Physics, University of Iowa

Favorite subject: Astronomy

Least favorite subject: Math methods

Subjects I wish I had studied more: Math



“Busy, Curious, Adventuresome”

Professional

What I do for the Cassini mission: I am the Deputy Principal Investigator for one of the science instrument packages on the Cassini orbiter called Radio and Plasma Wave Science (RPWS). RPWS will receive and measure the radio signals coming from Saturn, and will also measure properties of magnetic waves and electrons. As a scientist in Physics and Astronomy at the University of Iowa, I work in a group of about 45 people. I analyze scientific data, write papers and research proposals, interact with colleagues all over the world, and think about what space-based hardware can and cannot do.

In my work, I must know how to:

- Apply the physics of plasmas
- Use and program computers
- Write well
- Interact successfully with others
- Analyze science data from spacecraft
- Apply my understanding of electronics

William S. Kurth, continued

The coolest thing about my work is: I often get to be the very first human being to see specific types of observations returned from planetary spacecraft. On Voyager, everything we observed with the plasma-wave instrument was a new discovery since an instrument of that kind had never flown to Jupiter and beyond.

How I describe Saturn: Wonderful, Alien, Beautiful

How I describe Cassini: Ambitious, Required, Exciting

Why care about Cassini ? The Cassini mission will define virtually all that we know about the Saturn system. All of this new knowledge will tell us more about the way our solar system works and the way the planets formed. It will tell us whether it is likely or not that other planetary systems formed and that we should not consider ourselves alone in the Universe. It should give us a better understanding about how we came to be. If Cassini arrives at Saturn in good working order, we are guaranteed to be astounded and surprised by what we find!

Human Interest**How I Became Interested in Science**

When I was in high school, I noticed and photographed the aurora from my home in Iowa. I went to the public library to find out how the aurora are formed, but found very little. When I was an undergraduate student at the University of Iowa, I discovered that the space physicists there spent their entire careers studying the basic physics underlying the aurora. To be able to have a job pursuing my childhood curiosities has made me unbelievably fortunate.

My Most Exciting Experience at Work

As Voyager approached Uranus in early 1986, I plotted up some recent data from our plasma instrument and immediately noticed indications of the first radio emissions from Uranus. This provided the first evidence that the planet would have an extensive magnetosphere. Several days later, another instrument team agreed that we had seen Uranus, and we were all totally immersed in exploring yet another new world!

My Most Challenging Experience at Work

When the Galileo high-gain antenna failed to deploy, all of us were afraid that the mission would be a failure because the spacecraft would not be able to send back as much data. Instead, hundreds of people worked long hours, day in and day out, for nearly three years to find ways of making do with what we had. Instead of being able to send back 100,000 bits of information per second, Galileo could only send back about 10 bits per second. With some ingenious improvements they were able to increase this to about 100 bits of information per second. The rest of the job was up to the scientists to figure out how to make each bit count for more information. The results for our plasma instrument were remarkably good! With some clever programming, we were able to get the same quality of data using 5 bits of information per second instead of the 240 bits per second we had originally planned.

Ten Years from Now?

I hope that 10 years from now I will be analyzing Cassini data from Saturn and discovering why Saturn's moon Dione apparently controls the intensity of radio emissions generated in Saturn's magnetic field. I also hope to be continuing to monitor data from the two Voyager spacecraft, which will then be 100 times further from the Sun than is Earth.



Figure 13

Cassini
Team Member
Profile

Stephen Charles Lane (Steve) *Mechanical Designer*

Words of Wisdom

“Keep a child’s eye. Wonder at this marvelous Universe and take an active part in its exploration. Embrace the world, travel forth and explore with every God-given sense and talent, and with every good tool you can wield. Learn, and learn how to learn, and then experience every interesting and noble thing. Teach when your life’s experiences have become worthy of a child’s eye.”

Personal

Birth date: 7 September 1956

Home: Broomfield, Colorado

Children: Zachary (b. 1992), Madeline (b. 1997)

Favorite hobbies:

- Fishing
- Fixing things
- Photography
- Skywatching

Education

(All in Dallas, Texas)

Elementary: Holy Cross

Junior high: St. James

High school: Bishop Dunne

Highest college degree: BS in Architecture and Environmental Design, University of Texas at Arlington

Favorite subject: Science — I LOVE to explore.

Least favorite subject: I liked everything; I liked school.

Subject I wish I had studied more: More science!



“Loyal, Curious, Persistent”

Professional

What I do for the Cassini mission: I work at a laboratory in Colorado where we designed and built Cassini’s Ultraviolet Imaging Spectrograph (UVIS). UVIS can make images of the ultraviolet light reflected off Saturn’s rings and the atmospheres of Saturn and Titan. From this, we can learn more about their structure and composition. I laid out the initial mechanical design for the spectrograph. I also designed and implemented tests of how well (mechanically) the UVIS instrument would survive and perform during the stressful Cassini mission. I am just one member of a large team of engineers, scientists, machinists, and many others.

In my work, I must know how to:

- Do detailed technical drawings
- Apply engineering and math basics
- Listen carefully and communicate with scientists and machinists
- Use my imagination to solve problems

Stephen Charles Lane, continued

The coolest thing about my work is: Being involved in the whole process of creating a new tool to be flown on a spacecraft to make new discoveries.

How I describe Saturn: Distant, Mysterious, Wondrous

How I describe Cassini: Ambitious, Hopeful, Difficult

Why care about Cassini? Cassini is a mission of discovery. Discovery educates, inspires, and uplifts. It separates us from the “dog-eat-dog” drudgery of survival. It’s our nature to wonder, discover, and find out about the Universe. In every form (art, literature, science), the exploration of the Universe has always been the noblest of endeavors.

Human Interest**How I First Noticed the Stars**

Noticing the stars was one my earliest memories. My family has a lake in East Texas (Pinedale). It’s about 100 miles from the big-city lights of Dallas and 20 miles from the town of Tyler, Texas. I was probably 2 or 3 years old, but I “always” knew I’d see the whole Milky Way at the lake. We went several times each summer and I also saw bullfrogs, foxes, deer, snakes, turtles, wild turkeys, donkeys, cattle, and of course, fish (catfish, brim, bass). These days I take my own children there every year. My wife loves it too — pine trees, rolling hills, fresh air, and starry skies!

How I Came to Work on Cassini

When I was younger I wanted to be an astronaut, a space explorer, the first person on Mars! I started college in Aerospace Engineering, but switched to Environmental Design and Architecture. I’ve had some boring, everyday jobs in engineering and architecture. Thirteen years ago, I turned down two jobs in architecture to take a riskier job in aerospace. I’ve never regretted it! The job I have now has been challenging and mysterious every day. When it comes to designing an instrument like the UVIS for Cassini, my knowledge of the architectural design process sometimes serves me more than my engineering expertise. Often the solution is not so much about the numbers but more about the seeing all the possibilities (and then you crunch numbers).

Overcoming Adversity in My Career

No one achieves success without overcoming some adversity. At the time, we see our adversity (a problem, a person, a handicap) as the enemy. But when we persevere and succeed, we can see that the “enemy” was the teacher, and that we are stronger for the contest. The sixth and seventh operations on my right hand were successful, and I finally won my battle with repetitive stress injuries.

Ten Years from Now?

I expect to be doing much the same, only better, more fascinating and more fun!



Figure 14

Cassini
Team Member
Profile

Right:
"Paddy" Lock
visiting the
Star Trek
exhibit at the
National Air and
Space Museum in
Washington, D.C.,
during the fall
of 1992.

Patricia duFossé Lock *Systems Engineer*

Words of Wisdom

"There is nothing you cannot do. Don't let people tell you that you can't do something you dream of doing. Go for it; if one way doesn't work, try another. And you *can* have a career and a family. It's hard, but it's worth it, and we can help each other."

Personal

Birth date: 11 January 1961

Home: La Crescenta, California

Children: Graeme (b. 1992) and Connor (b. 1993)

Favorite hobbies:

- Reading, especially science fiction, history, and mythology
- Camping
- Cooking experiments
- Riding trains with my sons

Education

Elementary: Cranford, New Jersey and Beverly, Massachusetts

Junior high: Loyalsock, Pennsylvania

High school: Loyalsock, Pennsylvania, and Sunnyvale, California

Highest college degree: BS in Aerospace Engineering and Minor in Classics, San Diego State University, California

Favorite subject: English

Least favorite subject: Social Studies; "It amuses me that a subject I hated most in school is really the history I now love."

Subject I wish I had studied more: Foreign language



"Busy, Funny, Adventurous"

Professional

What I do for the Cassini mission: I engineer the system for distributing computers and all the proper software to Cassini scientists all over the world. I also assist scientists in the operation of 4 of Cassini's 12 instruments.

In my work, I must know how to:

- Think broadly
- Anticipate problems
- Use computers and the Internet
- Learn new things
- Negotiate with others

The coolest thing about my work is: Cassini is going to Saturn and will send back images we've only dreamed of. And I have a high-speed connection to the Internet on my desk to look at them!



Patricia duFossé Lock, continued

How I describe Saturn: Fascinating, Mysterious, Lovely

How I describe Cassini: Ambitious, Challenging, Hopeful

Why care about Cassini? The Cassini mission will be a benefit to all of us. The huge amount of new information we get back from it will help us develop a better understanding of the Solar System, Earth, and ourselves too! There may be solutions to problems we have here on Earth that will be discovered as a result of new information sent back by Cassini. Also, Cassini keeps our sense of wonder alive. If we don't stretch our limits and explore, if we don't learn new things, how can we grow?

Human Interest**My First Look at the Sky**

I remember watching the Moon out my window at night. I always wanted to go there. My father had a puppet he would pretend was a visitor from the Moon. We didn't figure it out until we were 12 or older! After I saw the Moon landing (I was 8 at the time), I knew I would always be in some way associated with space.

How I Came to Cassini

Since I began high school, I knew I wanted to do something technical. For a while I had wanted to be a physical therapist, but a couple weeks volunteering at my local hospital changed my mind. I always knew I would go to college

and have a career. My grades and test scores were much higher in English than math, but still OK in both when I began to think about engineering. It was an early idea, but it fit with my childhood dream of going to the Moon, so I discussed it with my advisor. Well, this advisor told me that I couldn't go to engineering school because I was a girl! Obviously this advisor didn't know me very well, because right then I made up my mind to do it. I've never regretted that decision.

During college I worked two internships. One of them was working on the Apache Helicopter. That was loads of fun! After college, I was hired by Martin Marietta (now Lockheed Martin) in Denver, where I was an engineer. Five years later my husband was offered a job at the Jet Propulsion Laboratory and we decided he should take it. I set up an interview, then never stopped calling JPL until someone hired me! The job they hired me for was on Galileo (NASA's mission to Jupiter). I changed jobs three more times, all on Galileo, before moving to Cassini in 1994.

My Most Challenging Experience at Work

When the high-gain antenna on Galileo failed to deploy, and only a limited amount of science data could be sent back, I was very involved in rethinking how all the science observations would be done with the new setup. All the processes our team had worked out before launch were thrown out and we started over. It was quite a big job, requiring much perseverance.



Figure 15

Cassini
Team Member
Profile

Ellis Devere Miner, Jr. *Science Manager*

Words of Wisdom

"Many people struggle to be recognized as great, as better than the rest, often by climbing over other people. Most only succeed in making enemies. The best and most successful, in my opinion, are those who unselfishly serve others in any way they can. There is no limit to what people can accomplish if they don't care who gets the credit."

Personal

Birth date: 16 April 1937

Home: Lake View Terrace, California

Children: (with wife Beverly) Steve (b. 1962), Marjorie (b. 1963), David (b. 1967), Jeffrey (b. 1970), Christin (b. 1972), Becky (b. 1976), Laura (b. 1980)

Favorite hobbies:

- Tennis, hiking, and mountain biking
- Studying family history
- Singing bass in a church choir
- Talking about astronomy and space science
- Tutoring students in math and science

Education

Elementary: Andrew Jackson Elementary in San Francisco and McKinley Elementary in Redwood City, California

Junior high: Logan Jr. High*

High school: Logan High*

*Both in Northern Utah

Highest college degree: PhD in Astrophysics, Brigham Young University

Favorite subjects: Physics and Algebra

Least favorite subject: Economics

Subjects I wish I had studied more: Geology and Meteorology



"Happy, Excited about space, Quick to understand new things"

Professional

What I do for the Cassini mission: I am the Science Manager for Cassini. I fund the U.S. scientists who are members of our Cassini science investigation teams. I also help set scientific priorities for the Cassini mission, direct some of the detailed planning for collection of science data, and serve as a science "expert" and spokesperson to broadcast media personnel and to other interested individuals and groups. I interact directly with about fifty people on the Cassini Project staff and with a similar number of scientists in the United States and Europe.

In my work, I must know how to:

- Apply basics of science
- Listen well
- Get along with others
- Use computers and e-mail
- Speak in public
- Express complex ideas in easy terms



Ellis Devere Miner, continued

The coolest thing about my work is: Getting to be close to and a part of such an exciting adventure as the Cassini mission, and to be one of the first to see the data (pictures and other information) coming back from the spacecraft.

How I describe Saturn: Beautiful, Intricate, Mystifying.

How I describe the Cassini mission: Well-designed, Unprecedented, Thrilling

Why care about Cassini? Spacecraft missions to the planets are a rare but very important way to learn about our neighborhood of the Universe. Keeping track of Cassini is a little like being there when the Declaration of Independence was signed, when Galileo first pointed a telescope at the skies, when William Herschel discovered the first new planet not known to the ancients, or when astronauts first stepped on the Moon!

Human Interest**How I First Noticed the Sky**

My interest in astronomy and the Solar System began in Redwood City, California, when I was still in grade school. I used to love to lie on my back at night and contemplate the stars and Moon. However, it wasn't until I was a physics graduate student that I decided to major in astrophysics and that I had my first glimpses of the heavens through a telescope.

How I Came to Cassini

I was a fan of Bing Crosby when I was very young, and thought it would be great to grow up to be a professional singer and actor. Unfortunately, my talents didn't quite match my ambition. Then I thought about being an astro-

naut, but I was an inch too tall. I also thought about being a religion teacher, but I have settled for teaching religion as a volunteer each morning during the school year (now in my 12th year). I sort of stumbled into my job at Jet Propulsion Laboratory when I needed employment for the 4 months between the time I got my PhD and when I had to report for active duty in the Army. The Army then assigned me to work at JPL for my 2 years of active duty, and I've been here ever since.

A Major Challenge in My Career

One of the more challenging problems was how to use the limited time and limited computer memory of the two Voyager spacecraft to accomplish the maximum amount of science, while at the same time avoiding heated arguments between scientists about whose data was most important. We managed to be able to satisfy almost every scientist who worked on Voyager. Sometime a few years before I joined the Voyager Project as Assistant Project Scientist, I was asked to serve for 5 years as a Bishop in my church (The Church of Jesus Christ of Latter-Day Saints). I learned valuable counseling skills and how to recognize and appreciate the efforts of individuals. These attributes have been very helpful to my success in the space program.

Ten Years from Now?

Ten years from now the Cassini spacecraft will still be collecting data in orbit around the planet Saturn. I plan to stick around until the Cassini mission is complete and then retire. I will be 71 by then, and perhaps my wife and I will serve an 18-month mission for our church somewhere in the world.



Figure 16

Cassini
Team Member
Profile

Fernando Peralta *Mission Design and Navigation*

Words of Wisdom

"Education is a must and should be pursued as a never ending endeavor. Education brings great personal pride, satisfaction, A great sense of accomplishment, and it opens one's horizons to unlimited and unimagined possibilities. I stand for honesty, integrity, and commitment to excellence."

Personal

Birth date: 8 January 1957

Home: La Cañada, California

Children: Catalina (b. 1979) and David (b. 1983)

Favorite hobbies:

- Photography
- Filmmaking
- Jogging
- Reading on diverse topics
- Contributing to my community

Education

Elementary and junior high: San Bartolome La Merced in Bogota, Colombia, South America

High school: Bogota, Colombia

Highest college degree: MS in Aerospace Engineering, University of Texas at Austin

Favorite subject: Humanities (history, literature)

Least favorite subject: English Composition

Subject I wish I had studied more: I wish I would have taken more and paid more attention to English since I came to realize how much I needed it when I started writing publications and memos to my colleagues at work.



"Positive, Enthusiastic, Participative"

Professional

What I do for the Cassini mission: I have participated in the design and analysis of the interplanetary trajectory of the Cassini mission. Presently, I'm more involved in the navigation aspect of the mission. I run computer simulations of the trajectory to be flown to Saturn. With a group of about 10 people, I ran tests and training exercises associated with the launch phase of the mission.

In my work, I must know how to:

- Use orbital mechanics
- Apply mathematics and physics
- Program computers
- Learn new things
- Get along with others

The coolest thing about my work is: The Jet Propulsion Laboratory stands for excellence in space exploration throughout the world and



Fernando Peralta, continued

being part of it is really cool. It's the coolest when you can make use of all the different interests and skills you possess, allowing you to keep growing at a professional and personal level.

How I describe Saturn: Fascinating, Mysterious, Magnificent

How I describe Cassini: Revealing, Engaging, Unique

Why care about Cassini? As with any JPL mission, Cassini will return new knowledge (both expected and unexpected) for the benefit of humankind, and if we're lucky, it will keep bringing information back to Earth beyond the predicted life-span of the mission. Cassini's development has also brought technical innovations thus creating possibilities for spin-off technologies which in turn can generate new jobs. Also, Cassini will undoubtedly create an immense sense of pride and accomplishment, not only at the local level but also throughout the world.

Human Interest**How I Feel about My Job**

My job is very challenging and rewarding. I believe that if a person likes what he/she does then that person gives more than what the written job assignments ask for, thus making use of all possible skills one can offer. In my case, I provide not only my technical skills and knowledge to JPL, but I also see myself as a public servant. Therefore, I promote science and space exploration at different outreach events. I give public talks and tours at JPL (even on Sundays). I volunteer at fair expos and I serve as liaison between JPL and different organizations, such as

schools. To me, even one person is worth approaching, especially if the person comes from a relatively poor or risk-filled living environment.

How I Came to Cassini

I loved flying since I can remember and thought of being a commercial pilot, but I was also very intrigued as to why the airplane was able to fly. Later, I was fascinated not only with air ventures but also with space. Once I decided that I wanted to do interplanetary mission design, I had two questions: 1) What were the best schools to provide me with the knowledge to do mission design? and 2) Was there a market in mission design at JPL? I didn't want to spend such an amount of resources and find out that at the end of the road there was no market for my skills. I got the name of a person to contact at JPL to see if I could work there once I had completed my Master's degree. I selected Bill O'Neil (at the time, Galileo project manager), which was the name with the highest rank listed in on a conference paper I found. I would confess that making that phone call was very intimidating to me. Bill very nicely referred me to Roger Diehl (at the time, Mission Design Manager for the Cassini program) who invited me over to JPL and very kindly offered me advice in regard to my questions. I have come to realize that there are always people willing to assist you and guide you if you ask for it.

Ten Years from Now?

I plan to go back to school and obtain an MBA once I finish the certificate I'm pursuing in filmmaking. Most importantly, I envision myself working on another exciting planetary mission.



Figure 17

Cassini
Team Member
Profile

David Allen Seal (Shaggy) *Mission Engineer and Computer Artist*

Words of Wisdom

“Work hard, play hard, and spend part of your life doing something that improves the human race and not just maintains it. Don’t be bothered by anything that won’t matter in 6 months.”

Personal

Birth date: 27 August 1968

Home: La Crescenta, California

Children: None

Favorite hobbies:

- Volleyball
- Playing in the ocean
- Playing the guitar
- Going to baseball games
- Playing race cars and Star Wars with my brother

Education

(All in Beverly, Massachusetts)

Elementary: Hardie and Cove schools

Junior high: Briscoe Middle School

High school: St. John’s Prep, a Catholic Boy’s School

Highest college degree: MS in Aerospace Engineering, Massachusetts Institute of Technology

Favorite subject: Creative Writing

Least favorite subject: A class called “multivariable control” that was all hairy math with no interesting examples.

Subject I wish I had studied more: Economics; I’m awful with money, and don’t have the first clue how to buy a house...compound interest and all that.



“Rich, Famous, and Popular, of course!”

Professional

What I do for the Cassini mission: I’m only working odd jobs for Cassini now, but my role was the lead mission engineer. Essentially, my tasks fell into four categories: find out what the scientists want to do at Saturn; find out what the engineers can design; do trade-off studies to get science needs and engineering designs to match; and communicate the results of those studies effectively. I worked on everything from figuring out what Earth antenna to use to communicate, to developing a strategy to use the recorders to save as much data as possible. I also make computer artwork and animations for Cassini that can be found on the Cassini website.

In my work, I must know how to:

- Apply engineering and math principles
- Use and program a computer
- Work well with people
- Write clearly
- Use my imagination

David Seal, continued

The coolest thing about my work is: I get to make artwork for Cassini and other projects, and they pay me to do it.

How I describe Saturn: Elegant, Majestic, and really really Big

How I describe Cassini: Ambitious, Illuminating and Expensive — but worth it!

Why care about Cassini? First, space is cool. Some day we'll be flying around the Solar System without any problem, and learning about it now is necessary if we are going to do that. Second, the space program is a great source of new technology. There are a lot of new inventions that come out of developing a spacecraft like Cassini. I really hope it discovers something totally incredible!

Human Interest**How I Became Interested in Space**

I was interested in space ever since I saw *Star Wars* and my Dad and I started looking through his telescopes. He's a really good amateur astronomer. I didn't live with him, but got to visit him during the summers (he was usually in a foreign country) so it was always a treat to get out the telescope and check out objects in the sky.

The Nature of My Work Environment

I work in one of the famous Dilbert-like "cubicles." But at least I have a window with a tree. I alternate between "tooling" on my own to working with teams of 4–8 people to get things done. I really recommend that people make

high school and college a social experience as well as an academic experience. I've seen plenty of people with good technical skills who weren't really accomplishing anything because they didn't know how to communicate with people. In my work environment, technical and people skills are equally important!

A Fun Challenge at Work

One of the more fun challenges was fitting people's signatures on a CD-ROM that will travel to Saturn with the spacecraft. After signatures are scanned in, I had to think of a way to fit as many as possible on a CD-ROM without making them impossible to read.

How I Came to Do Space Art

In 1993, I had been playing with some software that was used to make computer images during the Voyager flybys of Jupiter and Saturn. I was the only person who seemed interested in keeping the software working. Strangely, I had first heard of the Jet Propulsion Laboratory when I was 8 years old and saw images created by this software on TV. It was an amazing twist of fate that I would wind up being the person in charge of it. Anyway, I offered to use the software to do a color picture of a comet called Shoemaker–Levy 9 crashing into Jupiter. The image wound up in *Time* and *Sky & Telescope* and lots of other magazines, and also on TV, in videos, and in books. I couldn't believe how much press the image got, and decided that not only was it fun (the main reason I still do it), but it's something people get excited about. So I've continued to do space art when I can. It really is part of my job here, too, spreading the word about space to the public (which pays for NASA). Lots of my Saturn work can be found on the Cassini website.



Figure 18

Cassini
Team Member
Profile

Marcus Angelo Watkins (Marc) *Spacecraft Engineer*

Words of Wisdom

“Life is about learning, whether it is how to tie your shoe or how to fly an airplane. You learn from listening, observing, and questioning. *Take chances!!* Try almost anything as long as it will not hurt you! You are a unique individual and there is only one of you! Develop yourself into whatever you want. We live in America, where you have the best chance at becoming whatever you want to become. Most of the world does not have the opportunities that you have. Do not squander them. Embrace them!”

Personal

Birth date: 11 November 1960

Home: Santa Monica, California

Children: I am helping to raise my cousin Michael (b. 1987)

Favorite hobbies:

- Flag football
- Tennis
- Basketball
- Skiing
- Music (all kinds)

Education

(All in Lanham, Maryland)

Elementary: Lincoln and Seabrook

Junior high: Thomas Johnson

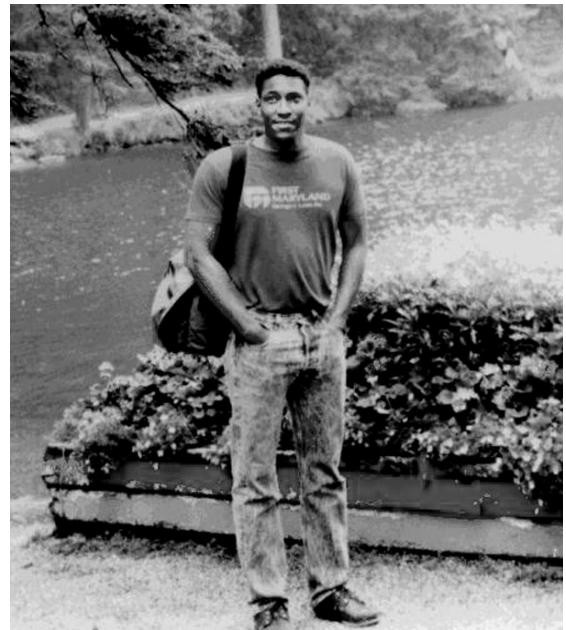
High school: Duvall

Highest college degree: MS in Engineering, George Washington University in Washington, D.C.

Favorite subject: Mathematics

Least favorite subject: English

Subjects I wish I had studied more: Spanish, Art, and Music



“Easygoing, Personable, Playful ”

Professional

What I do for the Cassini mission: I worked with the spacecraft manager and program manager on the antenna system and also the power and propulsion systems. Antennas are used to communicate with the spacecraft from the ground stations and to receive scientific data from the spacecraft. Power runs the radios, computers, and instruments. Propulsion moves the spacecraft from Earth into space and then on to Saturn.

In my work, I must know how to:

- Communicate with different people
- Apply technical skills in engineering, science, and math
- Be willing to try new things
- Have fun doing hard things

Marcus Angelo Watkins, continued

The coolest thing about my work is: Working on a spacecraft that travels billions of miles to investigate the Saturn system; working on one of the last of the huge spacecraft to be built; traveling to Germany and Italy to work with the Italians and Germans.

How I describe Saturn: Cold, Stunning, and Mysterious

How I describe Cassini: Complex, Scientific, Awesome!

Why care about Cassini? We should care about Cassini because knowledge is power, and learning anything new helps you and your civilization to grow and develop. If Cassini is successful, we will learn a lot more about Saturn, its rings, and its largest moon, Titan. Titan is the only moon in the Solar System that has a substantive atmosphere, and it is larger than the planet Mercury!

Human Interest**My First Looks at the Sky**

When I was in school, I heard about the Apollo missions landing on the Moon. I thought it was pretty cool that people were actually on the Moon when I looked up at it. I have always liked looking up at the stars and constellations. When I was younger I thought it would be nice to live on the Moon. Maybe I will still get my chance!

My Work Environment

When I worked on Cassini, there were about 20 people who worked within the project office and were responsible for managing the project.

There were also several hundred other people working on Cassini's design. Eventually, thousands of people would help build and launch Cassini. My job was hard because we were doing things that had never been done before, which makes it even more rewarding when it all works!! Most of the people who work for NASA do so because it's fun!

What I Wanted to Be When I Grew Up

First I wanted to be a policeman, then a fireman, and finally I decided to become a doctor. But then while in college, I changed my mind about becoming a doctor, and instead became an engineer. Neither of my parents had gone to college, but both were well-educated. They believed one should learn about many different things. I was the first one in my family to attend and graduate from college. My mom would help type my papers and my dad helped with some of my college expenses. I was a B to C student in high school and could get by without studying too much. But this made it very difficult for me when I went to college because I had poor study skills. I had to learn to study in order to get good grades. In my career I have changed jobs at least every 4 to 5 years. Yes, it's a little scary to try new things, but it pays off, and each time it gets a little bit easier.

Ten Years from Now?

Ten years is a long time! Hmmm, well, I hope that in ten years I will be working on the Space Station... or maybe working on the next Moon landing, or getting ready for the first mission that sends people to Mars!! I hope I will be working with some of you who become scientists, engineers, technicians, programmers, and teachers, helping to explain the mysteries of the universe and solving problems of the future!

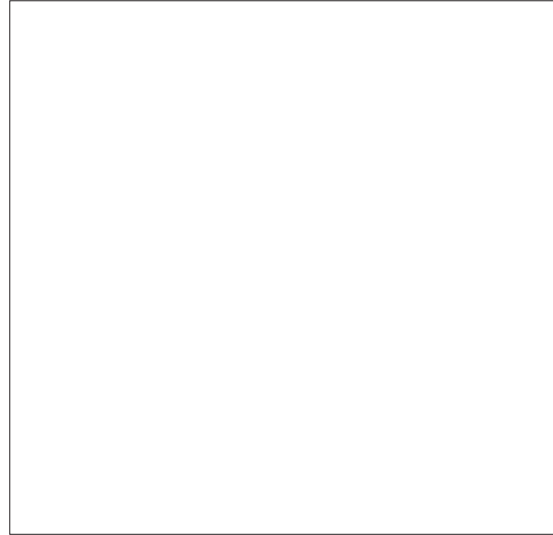
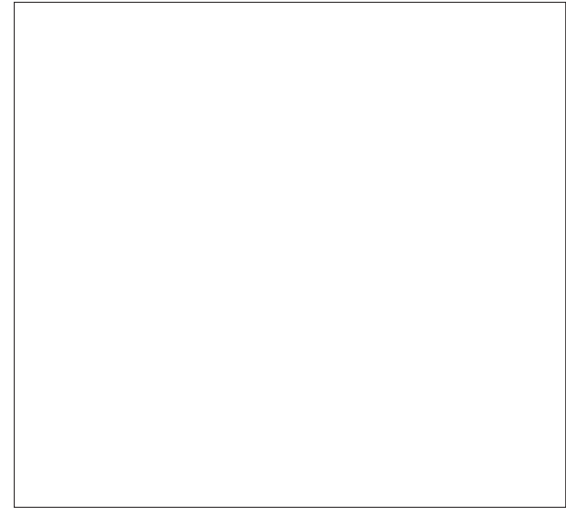


Student Profile (1 of 2)

Your name: _____

Your e-mail address: _____

Write three words that describe you:

Your Words of Wisdom

A Picture of You *(Draw a picture or attach a photo, then write a brief description of your picture.)*

Personal Information

Age (in Earth years): _____

Your address: _____

Brothers/sisters: _____

Your favorite hobbies: _____

Education

Your current grade level: _____

Your favorite subject: _____

Least favorite subject: _____

What subjects do you want to study more?



Student Profile (2 of 2)**Career Plans**

What do you want to be or do?

What will you need to study and know in order to do this job?

What would be the coolest thing about this job?

Saturn and You

What three words would you use to describe Saturn?

What three words would you use to describe the Cassini mission?

If you had a chance to work on a project like the Cassini mission, what would you want to do?

If you could write a 50- to 100-word message on a plaque and send it into space on a spacecraft, what would the message say?

When the Cassini spacecraft arrives at Saturn in the year 2004, what do you think you will be doing?

